UNITED STATES PATENT AND TRADEMARK OFFICE

**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Ex parte M. ALLEN NORTHROP, KURT E. PETERSON,
WILLIAM A. MCMILLAN, and GREGORY T.A. KOVACS

Appeal 2007-2078
Application 09/271,411
Technology Center 1600

Decided: June 28, 2007

Before TONI R. SCHEINER, DONALD E. ADAMS, and
RICHARD M. LEBOVITZ, *Administrative Patent Judges.*

LEBOVITZ, *Administrative Patent Judge.*

DECISION ON APPEAL

This is a decision on appeal from the final rejection of claims 45-50, 52-55, 57, 58, 60, and 62-70. We have jurisdiction under 35 U.S.C. § 6(b). We affirm.

STATEMENT OF CASE

The claims are drawn to a device for analyzing a sample and methods of using it. Claims 45-55 and 57-71 are pending (Br. 1). Claims 45-50, 52-55, 57, 58, 60, and 62-70 stand rejected over prior art (Br. 2). Claims 51, 59,

61, and 71 are objected to as being dependent on rejected base claims (Br. 2).

The Examiner relies on the following prior art as evidence of unpatentability:

Wilding	US 5,587,128	Dec. 24, 1996
Handique	US 6,130,098	Oct. 10, 2000

Rejections

Claims 45-50, 52-55, 57, 58, 60, and 62-70 stand rejected under 35 U.S.C. § 103(a) as obvious over Handique (Answer 3).

Claims 45-50, 52-55, 57, 58, 60, and 62-70 stand rejected under 35 U.S.C. § 103(a) as obvious over Handique in view of Wilding, or alternatively, Wilding in view of Handique (Answer 5).

Claims

Because separate reasons for patentability were provided, claims 45, 46-50, 52-55, 57, and 58 (Br. 3) stand or fall apart from claims 60 and 62-70 (Br. 5). We select claims 45 and 60 as representative, respectively, of each grouping. *See* 37 C.F.R. § 41.37(c)(1)(vi). Claims 45 and 60 read as follows:

> 45. A device for analyzing a sample, the device comprising:
>
> a) a body having:
>
> i) a reaction chamber for conducting a reaction;
>
> ii) a separation channel for separating sample components;
>
> iii) a transition region connecting the reaction chamber to the separation channel, wherein the portion of the body defining the transition region has sufficiently low thermal conduction so that the transition region substantially thermally isolates the reaction chamber from the separation channel; and

iv) at least one valve in the transition region for controlling fluid flow between the reaction chamber and the separation channel; and

b) at least two electrodes coupled to the body, the electrodes being positioned to induce electrophoretic flow, electroosmotic flow, or isoelectric focusing of the sample components in the separation channel when a voltage difference is applied between the electrodes.

60. A method for analyzing a sample, the method comprising the steps of:

a) introducing the sample into a device having:
i) a reaction chamber;
ii) a separation region;
iii) a transition region connecting the reaction chamber to the separation region, wherein the transition region has sufficiently low thermal conduction so that the transition region substantially thermally isolates the reaction chamber from the separation region; and
iv) at least one valve in the transition region;

b) subjecting the sample to a reaction in the reaction chamber while the valve is closed, wherein the transition region substantially thermally isolates the reaction chamber from the separation region during the reaction;

c) opening the valve;

d) injecting into the separation region a sample plug containing reaction products;

e) separating the reaction products in the separation region; and

f) detecting the separated reaction products.

ISSUE ON APPEAL

Would it have been obvious to a person of ordinary skill in the art at the time the invention was made to have modified the microscale device of

Handique by placing "at least one valve in the transition region" for controlling fluid flow between the reaction chamber and the separation channel as required by claims 45 and 60?

FINDINGS OF FACT

Handique

1. Handique teaches a microscale device for moving microdroplets through microchannels (Handique, col. 3, ll. 49-57).

2. The device comprises: entry ports (A) through which a sample is introduced, a reaction chamber (C) ("such as a thermally controlled reactor") in which reagent mixing and reactions occur, and an electrophoresis module (D) for separating reaction products (Handique, col. 13, ll. 19-34; Fig. 1; Answer 3).

3. A channel is located between the reaction chamber (C) and the electrophoresis module (D) (Handique, Fig. 1).

4. The device comprises electrodes which are positioned to perform electrophoresis in the electrophoresis module (D) (Handique, col. 13, ll. 57-59; col. 21, ll. 58-60).

5. Handique teaches "the use of sealed valves to control fluid flow" (Handique, col. 16, ll. 40-43; Answer 3, 7).

6. In one type of valve, a meltable solder material is used to seal the valve; a heating element melts the material, opening the valve (Handique, col. 16, ll. 43-61; Answer 3, 7).

7. Example 9 exemplifies a device with solder valves (Handique, col. 30, ll. 5-15; Fig. 13; Answer 4). *See* also Example 7 (Handique, col. 29).

8. Handique also teaches a capillary valve (Handique, col. 8, ll. 23-39) and a diaphragm valve (Handique, col. 10, ll. 57-65) to control fluid flow.

9. Fig. 12 shows "a schematic of one embodiment for manufacturing a sealable valve" (Handique, col. 12, ll. 3-4).

10. Handique teaches using the device to perform reactions (Answer 4). In Example 5, Handique shows a nucleic acid amplification reaction in a thermally isolated reaction chamber (Handique, cols. 27-28; Answer 4).

11. Handique teaches that the "mixing and reactions" occur in the reaction chamber prior (C) prior to entering the electrophoresis module (D) Handique, col. 13, ll. 19-30).

12. In Example 5, which involved testing the device components for biocompatibility (Handique, col. 27, ll. 34-40), the "reaction mix [was] covered with mineral oil to prevent evaporation" (Handique, col. 28, ll. 27-30).

13. The nucleic acid amplification reaction is described to occur in a "containment chamber" (Handique, col 28, ll. 35-36).

14. Nucleic acid amplification reaction involves several temperature and enzyme cycling steps (Handique, col. 28, ll. 30-33).

15. The reaction products of nucleic acid amplification can be electrophoretically separated and detected (Handique, col. 21, ll. 35 to col. 22, l. 3; Answer 4).

Wilding

16. Wilding teaches a device for "conducting a reaction to enable the rapid amplification of a polynucleotide in a sample" (Wilding, col. 4, ll. 10-14).

17. The device comprises a reaction chamber and flow channels (Wilding, col. 3, l. 47 to col. 4, l. 36; Fig. 7; Answer 6).

18. Wilding teaches "thermal cycling and application of different temperatures to different regions of the device (col. 7, lines 4-21)" (Answer 6).

19. Wilding's device "provides means for sealing one or more of the fluid inlet/outlet ports in the device during an amplification reaction. This advantageously prevents evaporation of liquids during thermal recycling and thus maintains the reaction concentrations during the amplification reaction" (Wilding, col. 7, ll. 57-62). *See* Answer 7.

20. "In one embodiment, an apparatus including means for delivering fluid to and from the reaction chamber through a port in the device, and adapted to interfit and/or interlock with the port is provided, which can reversibly seal the port after delivery of fluid to the reaction chamber" (Wilding, col. 7, ll. 62-66). *See* Answer 6.

DISCUSSION

Obviousness of claims 45, 46-50, 52-55, 57, and 58

Claim 45 is directed to a "device for analyzing a sample" which comprises a reaction chamber, separation channel, transition region, a valve between the reaction chamber and separation channel, and at least two electrodes coupled to the device.

The Examiner contends that Handique teaches a device which comprises each of the elements recited in claim 45 (Answer 3-4; Findings of Fact 1-9). The Examiner asserts that Handique further "teaches that any channel may comprise a valve to restrict or control fluid flow" (Answer 7; Findings of Fact 5-9).

Appellants' contend that the cited prior art fails to teach or suggest a valve to control fluid between the reaction and separation regions as required by claims 45 and 60 (Br. 4). They assert that high pressures can develop in reaction chambers due to gas expansion (Br. 4). They state that this pressure "can have detrimental effects on the separation medium (e.g., gel) in the separation channel" and cause chemicals to flow or diffuse into the separation region (Br. 4). Appellants' assert that the device of claim 45 overcomes "these problems with at least one valve in a transition region between the reaction chamber and separation region" (Br. 4).

Appellants argue that "Handique teaches away from placing valves in the device of Fig. 1" (Br. 4) because Handique explicitly states that its invention "contemplates the use of selective hydrophobic coatings to develop a liquid-sample injection and motion system that does not require the use of valves" (Handique, col. 13, ll. 63-66).

Obviousness requires a teaching that all elements of the claimed invention are found in the prior art and "a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does" *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1741, 82 USPQ2d 1385, 1396 (2007). We agree with the Examiner that the cited prior art provides adequate reason to have placed a valve "in the transition region" for controlling fluid flow between the reaction chamber and the separation channel as required by claims 45 and 60.

As established by the Examiner (Answer 3, 7), Handique teaches that its device comprises "sealed valves to control fluid flow" (Handique, col. 16, ll. 40-43; Findings of Fact 5). Handique describes several types of valves

(Findings of Fact 6-8). While Handique does not explicitly teach a valve between its reaction chamber (C) and electrophoresis module (D), the skilled worker would have recognized the advantage in placing a valve at this junction. Handique teaches that "mixing and reactions" occur in the reaction chamber prior to entry in the electrophoresis module (D) (Handique, col. 13, ll. 19-30; Findings of Fact 2, 11). In Example 5, which involved testing the device components for biocompatibility, the "reaction mix [was] covered with mineral oil to prevent evaporation" (Handique, col. 28, ll. 27-30; Findings of Fact 12). The reaction is described to occur in a "containment chamber" (Handique, col 28, ll. 35-36; Findings of Fact 13). Nucleic acid amplification reaction involves several temperature and enzyme cycling steps (Handique, col. 28, ll. 30-33; Findings of Fact 14). Thus, the skilled worker would have recognized the advantage of placing a valve between chamber (C) and electrophoresis module (D) to contain the reaction and to prevent evaporation during the long reaction time.

Furthermore, Wilding explicitly teaches sealing the reaction chamber which "advantageously prevents evaporation of liquids during thermal recycling and thus maintains the preferred reaction concentrations during the amplification reaction" (Wilding, col. 7, ll. 57-62). *See* Findings of Fact 18-19; Answer 7. Wilding's teaching provides a reason to have placed a valve between the reaction chamber and separation channel: to prevent evaporation during thermal recycling, thus making the claimed invention obvious over Handique in view of Wilding.

Appellants' argue that "Handique teaches away from placing valves in the device of Fig. 1" (Br. 4) because Handique explicitly states that its invention "contemplates the use of selective hydrophobic coatings to

develop a liquid-sample injection and motion system that does not require the use of valves" (Handique, col. 13, ll. 63-66). We are not convinced by this argument. As stated by the Examiner, "a reference is relied upon for the totality of its teachings" (Answer 7). *See W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1550-51, 220 USPQ 303, 311 (Fed. Cir. 1983) (the totality of a reference's teachings must be considered), cert. denied, 469 U.S. 851 (1984); *In re Gurley*, 27 F.3d 551, 553, 31 USPQ2d 1130, 1131 (Fed. Cir. 1994).

Handique contains numerous references to valves, including the statement that its device "contemplates the use of sealed valves to control fluid flow" (Handique, col. 16, ll. 40-42; Findings of Fact 5. *See* also Handique, col. 8, ll. 23-39; col. 16, ll. 43-61; col. 30, ll. 5-15; Fig. 12; Findings of Fact 6-9). Handique also describes manufacturing a sealable valve (Handique, col. 12, ll. 3-4; Fig. 12; Findings of Fact 9). Thus, contrary to Appellants' assertions, Handique discloses the use of valves in its device. Handique's statement that valves are not "required" for its "a liquid-sample injection and motion system" (Handique, col. 13, ll. 63-66) clearly does not mean that valves cannot be part of its device since valves are explicitly disclosed in certain embodiments of Handique.

Appellants' also state that "[w]here Handique shows a valve is in the different device of Fig. 13" (Br. 5). We do not find this argument persuasive. According to Handique, "Fig. 13 is a schematic of one embodiment for the layout of the movable sealing means of the present invention" (Handique, col. 12, ll. 5-6). Thus, Fig. 13 is not stated by Handique to show a complete device; it is an illustration of a valve that can be utilized in its device.

With regard to Wilding, Appellants' state that the reference "fails to teach or suggest a device having a valve in a transition region that connects a reaction chamber to a separation channel" (Br. 8). We do not find this argument persuasive. Wilding explicitly states that its device can contain a reversibly sealable port to contain fluid in the reaction chamber and prevent evaporation (Wilding, col. 7, ll. 57-66; Findings of Fact 19-20), providing a reason to have placed a sealing valve in the transition region of Handique's device.

Obviousness of claims 60 and 62-70

Claim 60 is directed to a "method for analyzing a sample" using a device which comprises a reaction chamber, separation channel, transition region, at least one valve in the transition region. In step d), claim 60 requires "injecting into the separation region a sample plug containing reaction products."

The Examiner contends that "[i]t would further have been obvious to have injected a sample as a 'plug' [as required by claim 60] in the method of [Handique] where the motivation would have been to improve electrophoretic resolution, as taught by [Handique] as being a desired result (col. 21, lines 37-51)" (Answer 5). As we agree with this reasoning, and since Appellants' do not identify any defect in it, we affirm the rejection of claim 60. Because separate reasons for their patentability were not provided, claims 62-70 fall with claim 60.

Conclusion

For the foregoing reasons, we find that the Examiner has set forth adequate evidence to establish prima facie obviousness of the claimed subject matter over (1) Handique and (2) Handique in combination with Wilding. Appellants' have not provided sufficient evidence to rebut the rejections. Accordingly, we affirm the rejections of claim 45. Claims 46-50, 52-55, 57, and 58 fall with claim 45 because separate arguments for their patentability were not provided. Because we have affirmed the rejection of all appealed claims over Handique in view of Wilding, it is unnecessary for us to consider the alternative rejection of Wilding in view of Handique.

TIME PERIOD

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

Affirmed

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